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SERIE: FISKERI · BIND IX

Nr. 4. Erik M. Poulsen: ON THE SPAWNING PLACES OF THE HERRING IN CERTAIN PARTS OF THE NORTH SEA, THE SKAGERAK, AND THE KATTEGAT IN THE AUTUMN OF 1930 AND SOME EARLIER YEARS.

KØBENHAVN
C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI A/S
1932

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FOR DANMARKS FISKERI- OG HAVUNDERSØGELSER
SERIE: FISKERI · BIND IX · NR. 4 · 1931

ON THE SPAWNING PLACES OF THE HERRING IN CERTAIN PARTS OF THE NORTH SEA, THE SKAGERAK, AND THE KATTEGAT IN THE AUTUMN OF 1930 AND SOME EARLIER YEARS

MED DANSK RESUMÉ

BY

ERIK M. POULSEN

KØBENHAVN
C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI A/S
1931

The autumn spawning herring of the North Sea plays a very conspicuous part in the herring fishery of this water, and after A. C. JOHANSEN in 1924 and 1927[1] proved that the herring making out the bulk of the great winter herring fishery at Bohuslen is identical with the autumn spawning herring of the North Sea (the Bank Herring) and consequently that large shoals of the North Sea herring migrate annually from the North Sea towards the Swedish coast, the significance of studying the biology of this herring race has increased considerably.

During later years a great number of papers have been published concerning the situation of the spawning places of the Bank Herring in the North Sea and the time of spawning. Investigations of his own and of others (FULTON 1891, HJORT 1905, BOEKE 1906, REDEKE and VAN BREEMEN 1907—1908, RUSSELL 1914, BJERKAN 1917, MEEK 1919, BORLEY and RUSSELL 1922, WOOD 1922, BOWMAN 1923) were used for a basis by A. C. JOHANSEN when in 1924 and 1927 he published charts showing the principal spawning area of the Bank Herring of the North Sea (see Fig. 3).

During the latter part of September and in October 1930 a series of fishing experiments were made from the Danish research vessel S. S. "Dana" with ring trawl and Hensen Net in the Kattegat, the Skagerak, and the central part of the North Sea. The principal object of these investigations was to procure information as to the situation of the spawning places of the autumn spawning herring and the intensity of spawning, which could be effected through a determination of the distribution of the tiny herring larvae.

The ring trawl fishing was carried out in such a way that the hauls were made in the lower layers of water. In the area off the western coast of Jutland and in the Kattegat and the Skagerak part of the hauls were made as step hauls. The duration of the hauls was in most cases 30 minutes. At most of the stations and especially within areas where herring larvae were captured with the ring trawl vertical hauls, too, were made with Hensen Net (aperture $^1/_3$ sq. m.) from bottom to surface. Similarly — and principally within areas where herring larvae were met with — hydrographic investigations were made concerning temperature, salinity, and, in some cases, oxygen content.

The herring larvae caught with ring trawl were measured immediately after the capture, i. e. in unpreserved state.

In Table I are put down numbers of herring larvae caught per 30 minutes with ring trawl and per 1 sq. m. of surface in vertical hauls from bottom to surface with Hensen Net. In Table II are put down length measurings of larvae caught with the ring trawl.

On the Charts Figs. 1 and 2 are put down numbers of larvae of less and more than 10 mm. in length, respectively, taken per 30 minutes with the ring trawl at the various stations in the North Sea and the Skagerak; where no number is given no larvae were caught.

During the cruise of S. S. "Dana" in the North Sea in the autumn of 1930 the area from the Danish coast across the Jutland Bank to the Little Fisherbank and from the Horns Reef Area to the eastern part

[1] A. C. JOHANSEN: On the summer and autumn spawning Herrings of the North Sea. Medd. fra Kommissionen f. Havunders. Ser. Fiskeri, Bd. VII, Nr. 5, 1924.

A. C. JOHANSEN: On the Migrations of the Herring. Journal du Conseil. Vol. II, Nr. 1, 1927.

Fig. 1. Number of Herring larvae below 10 mm. in length caught per 30 minutes in ring trawl in the North Sea and the Skagerak in September—October 1930.

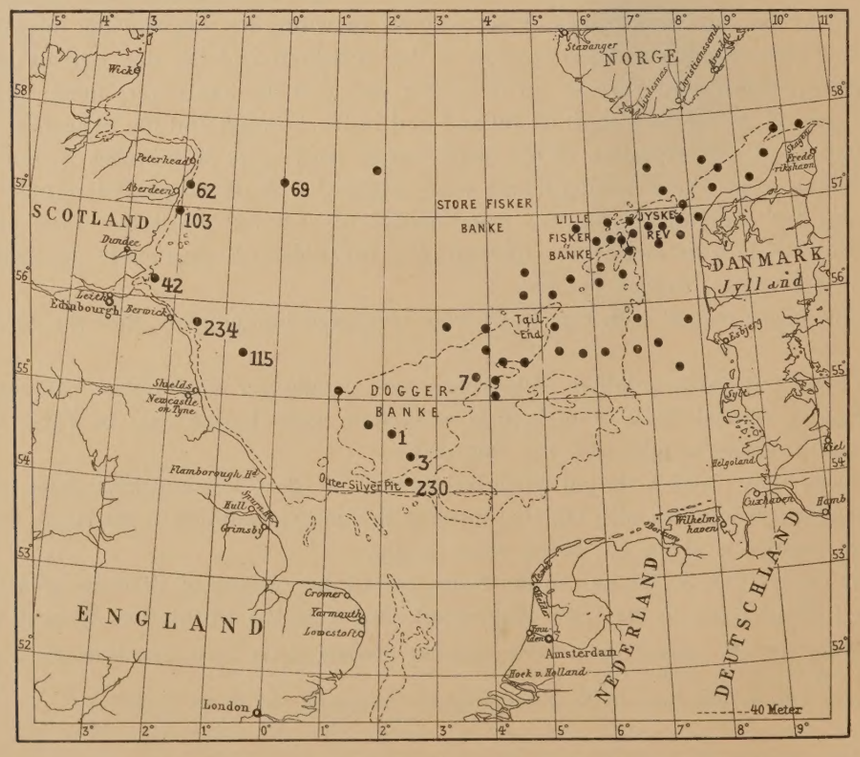

Fig. 2. Number of Herring larvae above 10 mm. in length caught per 30 minutes in ring trawl in the North Sea and the Skagerak in September—October 1930.

of the Dogger Bank was specially investigated, but investigations were also extended across the Great Fisherbank and Long Forties to the eastern coast of Scotland and across the central and south-western part of the Dogger Bank with the Outer Silver Pit to the coast of Northumberland. In the Skagerak especially the southern areas and in the Kattegat more particularly the northern and eastern part were investigated.

If we look at the Charts Figs. 1, 2, 9, and 10 we see that the investigations manifest two different spawning areas, viz., one in the western North Sea and the other in the Kattegat.

In the North Sea herring larvae were only met with W. of 4° E. in the autumn of 1930. In these investigations the eastmost occurrence of herring larvae in the North Sea is about the middle of the Dogger Bank in 55°23′ N.; 3°40′ E. In this place a 30 minutes' haul with the ring trawl yielded 220 larvae of less and 7 larvae of more than 10 mm. in length.

If, moreover, we look at the Chart Fig. 1, showing the occurrence of larvae of less than 10 mm. in length, we see that in the North Sea the latter are found within two areas. One of them comprises the central and south-western part of the Dogger with the Outer Silver Pit. Investigations were not extended farther southwards than to the Outer Silver Pit, but judging by the great number of larvae taken at the station of the Outer Silver Pit it is very probable that the distribution of the tiny larvae and with this the spawning area extended still farther towards the south. The other area where tiny herring larvae were found are the inshore waters off the coast of Scotland and the North of England (Northumberland) W. of 1° W.

If we look at the Chart Fig. 2, showing the distribution of the larger sized larvae — more than 10 mm., we see that they disperse over a somewhat greater area than the tiny larvae. Off Aberdeen the large sized larvae were found as far eastwards as on the Long Forties, while the tiny larvae were only caught in the inshore waters. At Long Forties (Stat. 4306) a 30 minutes' haul yielded 69 larvae which had a length of 13—26 mm. (see Table II) and an average length of 19.4 mm. At the two stations immediately E. of Aberdeen (Stats. 4307 and 4308) the larvae caught with the ring trawl only averaged 12.5 mm., i. e., nearly 7 mm. less than the larvae of the Long Forties. At another station (Stat. 4309) in the inshore waters at May Island in the mouth of the Firth of Forth 42 larvae averaging 12.6 mm. were taken in a 30 minutes' haul. Off the coast of Northumberland, abt. 7 miles N. of the Longstone Lighthouse (Stat. 4310) rather small larvae were also found, viz., 253 in a 30 minutes' haul varying between 6 and 16 mm., the average length being only 11.6 mm. Farther seawards, abt. 33 miles E. of Coquet Island (Stat. 4311) the larvae were considerably longer; here 115 larvae were fished measuring between 10 and 22 mm. and with an average length of 16.6 mm., i. e., 5 mm. longer than the larvae of the inshore waters. At two stations still farther seawards in the direction of the Dogger Bank no larvae were found. So we see that both at the coast of Northumberland and at the eastern coast of Scotland circumstances are the same; the farther we get away from the inshore waters the larger and scarcer do the larvae grow. This fact proves that in this part of the North Sea the spawning places are situated rather near the coast, and the larvae fished farther seawards are evidently derived from the spawning places along the coast.

On the southern part of the Dogger Bank and in the Outer Silver Pit the larvae are smaller than those collected on the same days not only seawards off these places but also on the grounds along the coasts of Scotland and Northumberland. At Stations 4315 and 4316 on the Dogger itself 1 and 78 larvae, respectively, and in the Outer Silver Pit (Stat. 4317) 745 larvae were fished per 30 minutes. By far the greatest number of these larvae were less than 10 mm. in length, the average length being less than 9 mm., and not a few larvae with yolk-sac were observed. The difference in size between the larvae of the latter area and those from off the coasts of Scotland and Northumberland confirms the well-known fact that the spawning at the Dogger Bank takes place later than within the lastmentioned area. Farther eastwards on the Dogger (Stat. 4319) many tiny larvae were also found; here a 30 minutes' haul yielded 227 larvae, the length of which varied between 6 and 10 mm., the average length being only 8.4 mm.; several of these larvae were still with yolk-sac. It is obvious that on the days of the investigation — Oct., 18th and 19th — an abundant hatching of larvae took place on the western and central part of the Dogger Bank with the Outer Silver Pit. North, South, and

East of Stat. 4319 on the edges of the Dogger Bank and farther shorewards towards the coast of Jutland no herring larvae occurred; so the eastward current within this area (see Fig. 3) has not yet carried great quantities of larvae towards the coast of Jutland. This fact in connection with the small number of larger sized larvae

Fig. 3. Resulting currents in the upper layers of the North Sea and main spawning places for the Bank Herring, and fishing places for spents and recovering spents in the Skagerak (after A. C. Johansen, 1927).

suggests that at this time (the middle of October) the spawning on the Dogger Bank has not yet been going on for a long time.

On the Chart Fig. 3 (from A. C. Johansen, 1927) is pointed out the area in which the principal spawning of the Bank Herring in the North Sea mainly occurs. A comparison between this chart and Figs. 1 and 2 will show that the spawning of 1930 in the part of the North Sea investigated here took place on the whole within the normal spawning area of the Bank Herring except that no larvae were observed on the north-western edge of the Dogger Bank in 1930.

A. C. Johansen (1924) shows that the temperature of the bottom water is highly contributing towards

the fixing of the spawning places and spawning times of the Bank herring, the spawning generally taking place in water of 9°—13° only. By the Charts attending the paper of A. C. JOHANSEN (1924), Figs. 6—9, it appears that the colder water from the North-eastern part of the North Sea wedges in towards the English coast between Shields and Flamborough Head.

This advance of colder water divides the spawning area into a northern and southern part (se Fig. 3). The investigations of 1930 also indicate such a rough bipartition of the spawning area, no herring larvae being observed at the stations within the area between the Northumbrian inshore waters and the Dogger Bank while tiny herring larvae occurred both N.W. and S. E. of this area. Also the hydrographic observations from the cruise of S. S. "Dana" in 1930 show that at the stations N. W. of the Dogger where no herring larvae were fished the bottom water is somewhat colder than at the stations on and S. of the Dogger Bank where tiny herring larvae occurred. Immediately N. W. of the Dogger Bank (Stat. 4312) the temperature of the bottom water (30 m.) was 11.9° on 17 Oct. while on the southern edge of the Dogger Bank (Stat. 4316, 35 m.) it was 13.2° on 18 Oct.

During the days of investigation the salinity of the bottom water at the spawning places on the south-western and central part of the Dogger Bank was found to range from 34.6 pro mille to 34.7 pro mille while the oxygen content varied between 5.7 and 5.9 c. cms. per litre. The salinities found here fall within the salinities at the spawning places of the Bank Herring as stated by A. C. JOHANSEN, viz., 34.0—35.2 pro mille.

As stated above no herring larvae were observed within the area between 4° E. Long. and the coast of Jutland during the investigations of 1930 (Sept., 28th—Oct., 22nd). Consequently the autumn spawning of 1930 within this area must have been insignificant. However, some few observations show that in the autumn of 1930 some spawning took place between the Little Fisherbank and the coast of Jutland. At the beginning of October, e. g., some fishermen at one place between the Little Fisherbank and Jutland Bank observed herring spawn sticking to the bottom trailing gears. Still closer to the Danish coast a less extensive spawning took place too. From Thyborøn to Hanstholm small quantities of mature herrings were sometimes fished close on the coast during Sept.—Oct. A small sample of 38 herrings caught in drift net on Sept., 30th, 1930 in the vicinity of the coast were analysed and consisted of 24 ♂ and 14 ♀, all of maturity V.

From previous years we have observations concerning the spawning of the herring in the area round Jutland Bank and the Little Fisherbank. DUGE (1903)[1] states that in the autumn of 1903 great quantities of herring spawn were found in the stomachs of haddock and other bottom fish caught on Jutland Bank and the Little Fisherbank and that great quantities of herring eggs, too, were brought up with the fishing gears. These observations show that a very intense spawning took place in the eastern part of the North Sea in 1903. From the years 1922, 1924, 1925, and 1926 A. C. JOHANSEN (1927) has published investigations on the spawning of the herring within the said areas. In 1922, 1925, and 1926 some few herring larvae of less than 10 mm. in length were captured with ring trawl per 30 minutes' hauls (yet 24 larvae at one station in 1922).

In the years 1924—1929 analyses were made of the stomach contents of haddock caught in the waters between the coast of Jutland and the Little Fisherbank during the commercial fishery of September—December. The results from the years 1924—1926 were published by A. C. JOHANSEN (1927, l. c.). In none of these years herring spawn was observed in the haddock stomachs. In the years 1927, 1928, and 1929 such analyses of the stomach contents of haddock were also made and from the years 1928 and 1929 we have furthermore information given by fishermen. On the Charts Fig. 4 are marked down the results of the stomach analyses together with the information given in these years by the fishermen. In 1927 haddock stomachs from the area between 4° E. Long. and the coast of Jutland were examined; no herring spawn was found in any of the stomachs. In 1928 were examined haddock stomachs from a small area only, between the coast of Jutland and the Jutland Bank; no herring spawn was observed. During the autumn of that year, however, "spawny" haddock were caught by English fishermen[1] on the Little Fisherbank and S. of the Jutland Bank. So we see that some spawning took place in this part of the North Sea in 1928.

[1] DUGE: Heringseier im Magen der Schellfische. Mitt. d. Deutschen Seefischereivereins, 1903, p. 460.

[2] By kind information from Dr. W. G. HODGSON.

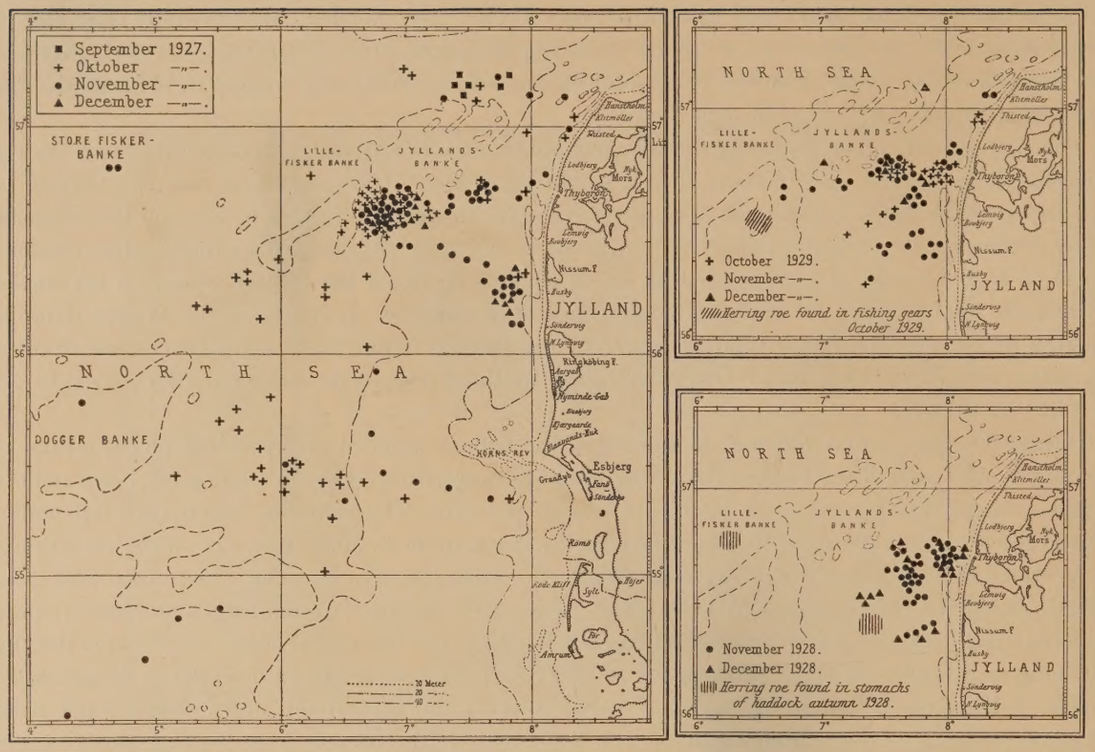

Fig. 4. Localities where observations were made regarding the occurrence of Herring eggs in the stomachs of haddocks and in fishing gears in the years 1927, 1928, and 1929 during the autumn in the North Sea. (No herring spawn was observed in the stomachs).

In 1929 analyses were made of the stomach contents of haddock caught in the waters from the Danish coast to the Little Fisherbank; no herring spawn was observed in any of the stomachs examined. In the area immediately S. of the Little Fisherbank, however, herring spawn was observed by Danish fishermen in October in bottom trailing gears. As mentioned above herring spawn was also observed in bottom trailing gears in 1930.

As to the spawning of the herring on the Jutland Bank and the Little Fisherbank with surroundings it is proved by investigations through a series of years that generally only an insignificant spawning takes place within this area, but the spawning of one particular year (1903) was of great significance. A. C. JOHANSEN (1927) states that in 1903 there was an exceedingly vigorous inflow of oceanic water into the intermediary water layers of the Skagerak and that we may well suppose that the very intensive spawning of 1903 was a consequence of the abnormal hydrographic circumstances. During the cruise of S. S. "Dana" in 1930 a series of observations as to salinity and temperature at various depths were made on Sept., 25th and Oct., 29th in a line N. by W. of Hanstholm, i. e. in the western part of the Skagerak[1]. In the subjoined table 1 (pag. 9) these observations are given together with observations from the years 1903, 1922, and 1925 (after A. C. JOHANSEN, 1927).

It appears from the table that the salinity of the intermediary water layers in the Skagerak during the autumn of 1930 was greater than usually though it did not quite reach the high values of 1903. It is true that the observations of 1930 were made farther seawards than in the previous years, but even allowing for this fact the salinity measured was higher than usually. In the Kattegat, too, the salinity was considerably above the normal in the autumn of 1930. Considering the conspicuous inflow of very saliferous water to the intermediary water layers of the Skagerak met with in these observations it is a remarkable fact that the

[1] The titrations for the determinations of salinity were performed at the Danish Hydrographic Laboratory (Prof. MARTIN KNUDSEN).

Tab. 1. Salinity observations (pro mille) from the western Skagerak in September, October, and November.

Observer	Swedish	Danish		Danish	Danish			
Year	1903	1922		1925	1930			
Date	Nov. 12th	Oct. 12th		Oct. 12th	Sept. 25th		Oct. 29th	
N. Lat.	58°10′	58°13′	58°06′	57°42′	57°31′	57°36′	57°31′	57°37′
E. Long.	10°18′	9°34′	9°35′	9°04′	8°18′	8°13′	8°18′	8°13′
0 m.	30.12	30.41	30.97	32.81	34.18	32.09	33.73	33.35
50 »	34.99	35.01	34.96	34.99		35.03	34.42	34.70
60 »	35.01	—	—	—	34.58	—	34.70	—
70 »	—	—	—	—	—	35.16	—	—
75 »	35.03	35.16	35.03	34.99	—	—	35.07	—
100 »	**35.34**	35.12	35.05	35.05	**35.25**[2]	35.19	35.19	35.19
125 »	**35.23**	—	—	—	—	—	—	—
150 »	**35.25**	—	—	35.07[1]	—	**35.21**	—	**35.23**
200 »	35.17	35.17	35.16	—	—	—	—	35.19

[1] 140 m. [2] 95 m.

spawning of the herring in the area round the Jutland Bank turned out to be of so slight importance as shown by the investigations. We may then no doubt suppose that the spawning of the herring in the Jutland Bank Area to a considerable degree depends on other factors than the salinity. In the somewhat deeper parts (outside abt. 30 m.) of this area the temperature obviously was too low as shown by the following observations:

2 Oct. — 1930 55°33′ N., 4°22′ E.		28 Oct. 1930 56°52′N., 6°24′E.	
0 m.	14.2	0 m.	10.60
15 »	13.1	15 »	10.60
25 »	11.0	20 »	10.61
37 »	9.3	30 »	9.83
		50 »	8.80

In the shallower waters, however, inside the 30 m. curve the temperature was suitable, abt. 12°—13°.

During the investigations in the autumn of 1930, as stated above, no herring larvae were found in the whole part of the North Sea situated E. of 4° E. Long. The few observations of herring spawn from the area round the Jutland Bank in 1930 and some few earlier years together with the small quantities of herring larvae captured here in certain years prove that the spawnings within this area must be quite insignificant. In the Skagerak earlier investigations (A. C. Johansen, 1924) exhibit a still scarcer occurrence of tiny herring larvae during the autumn months, and in 1930 no herring larvae at all were observed in this water. In the eastern Kattegat, however, the herring larvae once more begin to occur in greater quantities. In the waters E. of Læsø and down towards Anholt an important herring fishery takes place during the autumn months; the bulk of the herrings caught in this fishery are autumn spawning. After A. C. Johansen (1924) the principal spawning places of this herring are situated at Fladen, Groves Flak, and E. of Kobbergrunden, and he names this herring, which belongs to a special race, the Kobbergrund Herring.

In the literature we have a series of observations on the situation of the spawing grounds of the Kobbergrund Herring in various years.

In 1922 (A. C. Johansen, 1924) by far the greatest numbers of tiny herring larvae were found in the area round Fladen. In 1927 and 1928 observations are rather scanty and not sufficiently elaborate to give a reliable picture of the situation of the breeding grounds of the herring. In 1929 by far the greatest number was captured E. of Kobbergrunden[1].

In October of both of the years 1925 and 1926 a series of fishing experiments were made from S. S. "Dana" through the Kattegat from the Skaw and down to the mouth of the Sound. The number of herring

[1] The observations from 1927, 1928, and 1929 are published in Transition Area Report (A. C. Johansen) for the respective years. Rapp. et Proc.-Verb. Vol. 49, 60 and 66.

larvae captured per 30 minutes with ring trawl or young fish trawl during these investigations are given in Figs. 5—8. A look at the Charts will show that in 1925 the most intense spawning took place E. of Kobbergrunden and in 1926 in the area round Trindelen. In 1930 (see Figs. 9 and 10) two 30 minutes' hauls were

Fig. 5. Number of Herring larvae below 10 mm. in lenght caught per 30 minutes in ring trawl in the Kattegat during the autumn of 1925.

Over the line: number of specimens caught in the upper layers.
Below the line: number of specimens caught in the lower layers.

Fig. 6. Number of Herring larvae above 10 mm. in length caught per 30 minutes in ring trawl in the Kattegat during the autumn of 1925.

Over the line: number of specimens caught in the upper layers.
Below the line: number of specimens caught in the lower layers.

made at the end of September (23—IX) in the eastern Kattegat, viz., E. of Kobbergrunden and E. of Læsø Trindel; none of these hauls yielded any herring larvae. When on October, 30th and 31st S. S. "Dana" was once more fishing in the Kattegat, herring larvae of less than 10 mm. in length were captured at all of the 9 stations worked in the eastern Kattegat from the Skaw and down to the mouth of the Sound. The greatest numbers of tiny larvae per 30 minutes (618 and 432) were captured E. of Anholt and at Lille Middelgrund. Towards the north the number of tiny larvae gradually decreased. Thus 242 fry were caught at Kobbergrunden, 106 E. of Læsø, 33 at Trindelen, and only 6 at Herthas Flak. Towards the south, too, a gradual decrease took place: at Store Middelgrund 81 and at the mouth of the Sound 10 fry were captured per 30 minutes. Also the number of larvae of above 10 mm. in length decreased strongly N. and S. of the area round Anholt and Lille Middelgrund. In 1930, thus, the most intense spawning took place in the waters E. of Anholt and at Lille Middelgrund. So we see that the spawning of the autumn herring in the Kattegat does not occur in the same spawning places every year; in some years the main spawning area is situated as far northwards as at Læsø Trindel, in other years as far southwards as at Anholt.

As there are reasons for the belief that these changes in the situation of the main spawning areas are connected with variations of the hydrographic conditions, I have in the subjoined table given the salinities of the bottom water at the Anholt Knob Light Vessel[1] in the months of September and October together with

Fig. 7. Number of Herring larvae below 10 mm. in length caught per 30 minutes in ring trawl in the Kattegat during the autumn of 1926.
Over the line: number of specimens caught in the upper layers.
Below the line: number of specimens caught in the lower layers.

Fig. 8. Number of Herring larvae above 10 mm. in length caught per 30 minutes in ring trawl in the Kattegat during the autumn of 1926.
Over the line: number of specimens caught in the upper layers.
Below the line: number of specimens caught in the lower layers.

a statement of the situation of the main spawning area in the different years from which there are fairly elaborate investigations.

Salinity of bottom water (Bundvandets Saltholdighed)

Year (Aar)	Sept.	Oct.	Mean (Middel)	Main spawning area (Hovedgydeomraade)
1922	32.5	32.7	32.6	Fladen
1925	32.3	31.6	32.0	E. of Kobbergrund
1926	30.4	31.2	30.8	Trindelen
1927	31.6	30.4	31.0	?
1928	31.9	32.3	32.1	?
1929	32.4	32.3	32.4	E. of Kobbergrund
1930	34.5	33.6	34.1	E. of Anholt
Mean (Middel)	—	—	32.0	—

Accordingly the salinity in the autumn of 1930 was 2.1 pro mille above the normal, and at the same time the spawning area was situated as far southwards as E. of Anholt. In 1926 the salinity was 1.2 pro mille

[1] After: Nautisk Meteorologisk Aarbog, København.

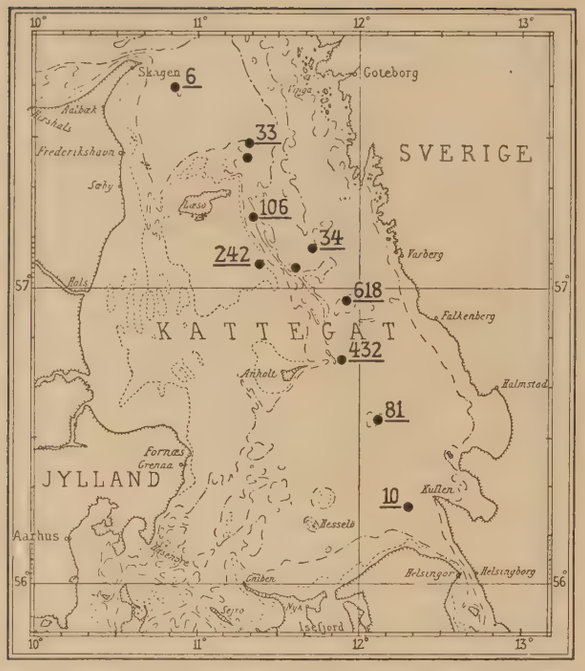

Fig. 9. Number of Herring larvae below 10 mm. in length caught per 30 minutes in ring trawl (step hauls) in the Kattegat during the autumn of 1930.

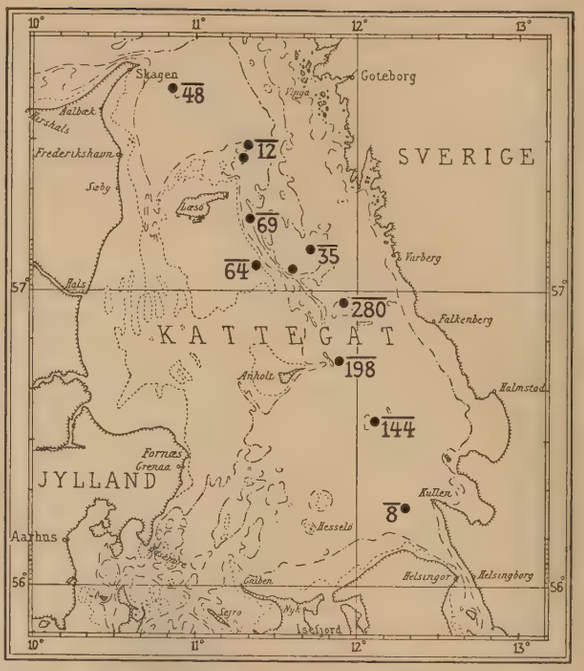

Fig. 10. Number of Herring larvae above 10 mm. in length caught per 30 minutes in ring trawl (step hauls) in the Kattegat during the autumn of 1930.

below the normal, and the spawning area was situated as far northwards as at Trindelen. On the whole the observations show that the situation of the spawning places of the autumn spawning herring in the Kattegat is dependent on the inflow of saliferous bottom water into the Kattegat. In years when this inflow is comparatively vigorous the spawning area is situated farther southwards than in years of a weaker inflow.

The observations of temperature at the spawning places made during various years show that the temperature of the bottom water at the times and places of the spawning ranges from 12°—14° C. Thus the Kobbergrund Herring will spawn in water which is abt. 1°—2° warmer than the water on the spawning places of the Bank Herring of the North Sea.

Dansk Resumé.

Nordsøens efteraarsgydende Sild spiller en særdeles stor Rolle for Sildefiskeriet i Nordsøen, og efter at A. C. Johansen i 1924 og 1927 har vist, at den Sild, der danner Grundlaget for det store bohuslenske Vintersildefiskeri, er den samme som Nordsøens efteraarsgydende Sild, og at den, efter endt Gydning sent paa Efteraaret, trækker ind i Skagerak for at æde og først trækker tilbage igen til Nordsøen i Begyndelsen af Foraaret, har denne Silderace faaet forøget Interesse ogsaa for det danske Fiskeri. Det skulde nemlig være muligt fra de danske Skagerakhavne at fiske denne Sild under dens Vandring til og fra Skagerak.

I den sidste Del af September og i Oktober 1930 blev der fra Havundersøgelsesskibet "Dana" foretaget en Række Fiskeforsøg med Ringtravl og Hensen Net i Kattegat, Skagerak og Nordsøen. Hovedformaalet med disse Undersøgelser var, gennem Fastlæggelse af de spæde Sildelarvers Udbredelse, at skaffe Oplysning om Beliggenheden af den efteraarsgydende Silds Gydepladser og om Gydningens Intensitet.

Betragtes Kortene Fig. 1, 2, 9 og 10, ses det, at der er 2 forskellige og vidt adskilte Gydeomraader: et i den vestlige Nordsø og et andet i Kattegat. I Nordsøen er Sildelarver i Efteraaret 1930 kun fundet vest for 4° Ø. L. Det østligste Sted i Nordsøen, hvor der ved disse Undersøgelser er taget Sildelarver, er omtrent midt paa Dogger Banke paa 55°23′ N. B. og 3°40′ Ø. L.

Gydeomraadet i Nordsøen er omtrent delt i 2 Dele; den ene omfatter den midterste og sydvestlige Del af Dogger Banke med Outer Silver Pit og Farvandene Syd og Vest herfor, det andet Kystomraaderne udfor Skotlands og Nordenglands Kyst vest for 1° V. L. Aarsagen til denne Tvedeling af Gydeomraadet er den, at det koldere Vand fra den nordøstlige Del af Nordsøen skyder sig som et kileformet Parti ind mod Englands Kyst mellem Shields og Flamborough Head.

Som allerede anført er der ikke i Omraadet mellem 4° Ø. L. og den jyske Kyst fundet Sildelarver ved Undersøgelserne i 1930 ($^{28}/_{9}$—$^{22}/_{10}$). Den Gydning, der i Efteraaret 1930 har fundet Sted i dette Omraade, kan da kun have været af ringe Betydning. Et Par Observationer viser, at der i Efteraaret 1930 dog har fundet nogen Gydning Sted mellem Lille Fiskerbanke og den jyske Kyst. Fiskere har saaledes i Begyndelsen af Oktober paa et enkelt Sted mellem Lille Fiskerbanke og Jyske Rev iagttaget Silderogn hængende fast ved de bundslæbende Redskaber. Endnu nærmere den danske Kyst har der ogsaa fundet en mindre omfattende Gydning Sted. Der er her paa Strækningen Thyborøn—Hanstholm i Maanederne September—Oktober af og til tæt under Land taget smaa Mængder af fuldmodne Sild. En lille Prøve paa 38 Sild fanget i Drivgarn d. 30. Sept. 1930 tæt under Land blev analyseret og bestod af 24 ♂ og 14 ♀ alle af Modenhed V.

Fra en Række tidligere Aar foreligger Observationer vedrørende Sildens Gydning i Omraadet omkring Jyske Rev og Lille Fiskerbanke. Duge (1903) anfører, at der i Efteraaret 1903 blev fundet store Mængder af Silderogn i Maver af Kuller og andre Bundfisk fanget paa Jyske Rev og Lille Fiskerbanke, ligesom ogsaa store Mængder af Sildeæg blev taget op med Fiskeredskaberne. Disse Iagttagelser viser, at der i 1903 har fundet en meget kraftig Gydning Sted i den østlige Del af Nordsøen. For Aarene 1922, 24, 25 og 26 har A. C. Johansen (1927) offentliggjort Iagttagelser over Sildens Gydning i de omtalte Omraader. I 1922, 1925 og 1926

blev der i Ringtravl taget ganske enkelte Sildelarver under 10 mm.'s Længde i $^1/_2$ Times Træk (paa en enkelt Station i 1922 dog 24 Larver).

I Aarene 1924—1929 er der foretaget Analyser af Maveindhold af Kuller fanget i Farvandet mellem den jyske Kyst og Lille Fiskerbanke ved Erhvervsfiskeriet i Maanederne September til December. For Aarene 1924—1926 er Resultaterne publiceret af A. C. Johansen (1927 l. c.). I ingen af disse Aar blev der iagttaget Silderogn i Kullermaverne. For Aarene 1927, 1928 og 1929 er der ligeledes foretaget saadanne Analyser af Maveindhold af Kuller og for Aarene 1928 og 1929 foreligger tillige Oplysninger modtaget fra Fiskere. Paa Kortene Fig. 4 er Resultaterne af Maveanalyserne tilligemed Angivelserne fra Fiskerne for disse Aar opført. I 1927 blev Kullermaver fra Omraadet mellem 4° Ø. L. og den jyske Kyst undersøgt; der blev ikke i nogen af Maverne forefundet Silderogn. I 1928 blev der kun undersøgt Kullermaver fra et mindre Omraade mellem den jyske Kyst og Jyllandsbanke; der blev ikke observeret Silderogn. Derimod blev der i dette Efteraar af engelske Fiskere[1] set Silderogn i Kullermaver fra Lille Fiskerbanke og syd for Jyllandsbanken. Der har altsaa i 1928 fundet nogen Gydning Sted i denne Del af Nordsøen.

I 1929 blev der foretaget Analyser af Maveindhold af Kuller fanget i Farvandet fra den danske Kyst og ud til Lille Fiskerbanke, der blev ikke iagttaget Silderogn i nogen af de undersøgte Maver. Derimod blev der af danske Fiskere i Omraadet lige syd for Lille Fiskerbanke iagttaget Silderogn i bundslæbende Redskaber i Oktober. I 1930 blev der, som anført, ligeledes iagttaget Silderogn i bundslæbende Redskaber.

Med Hensyn til Sildens Gydning paa Jyske Rev og Lille Fiskerbanke med Omgivelser, da viser de Undersøgelser, der er foretaget i Aarenes Løb, at der i Almindelighed kun finder en mindre Gydning Sted i dette Omraade, men at Gydningen i et enkelt Aar (1903) har været af stor Betydning.

I Skagerak viser de tidligere Undersøgelser en endnu sparsommere Forekomst af Sildelarver om Efteraaret, og i 1930 blev der slet ikke iagttaget Sildelarver i dette Farvand. I Kattegat optræder Sildelarverne atter i stor Mængde. Øst for Læsø og ned mod Kullen foregaar om Efteraaret et ret betydeligt Fiskeri efter gydende Sild. Efter A. C. Johansen (1904) gyder denne Sild — Kobbergrundsilden —, der er raceforskellig fra Nordsøens efteraarsgydende Sild, især ved Fladen, Groves Flak og Kobbergrunden. Dels gennem tidligere offentliggjorte Undersøgelser og dels gennem de i denne Afhandling anførte Undersøgelser (Fig. 5—10) kan vi danne os et Billede af Vekslingerne i Beliggenheden af Kobbergrundssildens Yngelpladser fra Aar til Aar.

I 1922 (A. C. Johansen, 1924) fandtes langt de fleste spæde Sildelarver i Omraadet omkring Fladen. I 1927 og 1928 er Observationerne ret faa og ikke tilstrækkelig omfattende til at give et paalideligt Billede af Beliggenheden af Sildens Yngelpladser. I 1929 toges langt det største Antal øst for Kobbergrunden.

I 1925 og 1926 blev der fra "Dana" i begge Aar i Oktober foretaget en Række Fiskeforsøg ned gennem Kattegat fra Skagen og ned til Indgangen til Øresund. Antallet af Sildelarver taget pr. $^1/_2$ Time med Ringtravl eller Yngeltravl ved disse Undersøgelser er anført paa Fig. 5—8. En Betragtning af Kortene viser, at i 1925 fandt den største Gydning Sted øst for Kobbergrunden og i 1926 i Omraadet omkring Trindelen. I 1930 (se Fig. 9 og 10) blev der i det østlige Kattegat i Slutningen af September (23/IX) taget 2 $^1/_2$-Times Træk øst for Kobbergrunden og øst for Læsø Trindel, i ingen af disse Træk fandtes Sildelarver; da "Dana" d. 30. og 31. Oktober atter fiskede i Kattegat, blev der paa alle 9 Stationer, der blev taget i det østlige Kattegat fra Skagen og ned til Indgangen til Sundet, taget Sildelarver under 10 mm's Længde. De største Antal spæde Larver per $^1/_2$ Time (618 og 432) blev taget øst for Anholt og ved Lille Middelgrund. Mod Nord aftog Antallet af spæde Larver gradvis. Ved Kobbergrunden toges saaledes 242, øst for Læsø 106, ved Trindelen 33 og ved Herthas Flak kun 6. Sydpaa fandt ogsaa en gradvis Aftagen Sted: ved store Middelgrund toges 81 og ved Indgangen til Sundet 10 per $^1/_2$ Time. Ogsaa Antallet af Larver over 10 mm.'s Længde aftog stærkt Nord og Syd for Omraadet Anholt—Lille Middelgrund. I 1930 fandt altsaa den største Gydning Sted i Farvandet øst for Anholt og ved Lille Middelgrund. Efteraarssildens Gydning i Kattegat finder saaledes ikke hvert Aar Sted

[1] Efter venlig Oplysning af Dr. W. G. Hodgson.

paa de samme Gydepladser, i visse Aar ligger Hovedgydeomraadet saa langt mod Nord som ved Læsø Trindel, i andre Aar saa langt mod Syd som ved Anholt.

En Undersøgelse af Hovedgydepladserne i Forhold til Vekslinger i Saltholdigheden i Efteraarsmaanederne (se Tabellen Side 11) viser, at Beliggenheden af Kattegats efteraarsgydende Silds Gydepladser er afhængig af Indstromningen af saltholdigt Bundvand til Kattegat. I Aar, hvor denne Indstrømning er forholdsvis stærk, ligger Gydeomraadet længere mod Syd end i Aar, hvor Indstrømningen er svagere.

Table I. List of Stations where Fishing Experiments with 2 Metres Ring Trawl and Hensen Net were carried out in the North Sea, Skagerak and Kattegat during the "Dana" Cruise in Autumn 1930.

Station No.	Date and hour	Locality	Central Position	Depth in m.	Length of wire, m.	Duration of fishing, hours	No. of herring larvae caught	Size of larvae mm.			No. of larvae caught per ½ hour			No. of larvae caught in bottom-surface hauls with Hensen Net per m².
								minimum	average	maximum	total	below 10 mm.	above 10 mm.	
4264	Sept. 23. 6³⁰	13 miles SSE. of Læsø	57°08′ N. 11°26′ E.	70	50	½	0	..	..	..	..	..	..	..
—	- - -	—	— —	—	75	—	0	..	..	..	..	..	..	..
4265	- - 9³⁰	2.5 miles E.b.S.½S. of Læsø Trindel	57°28′ N. 11°25′ E.	28	70	—	0	..	..	..	..	..	..	..
4271	- 25. 8³⁰	11 miles N.½W. of Hanstholm	57°17′ N. 8°32′ E.	26	..	..	..	..	..	..	..	..	..	0
4272	- - 10²⁵	19 miles N.¾W. of Hanstholm	57°25′ N. 8°24′ E.	51	..	..	..	..	..	..	..	..	..	0
4273	- - 12²⁵	26 miles N.b.W. of Hanstholm	57°31′ N. 8°18′ E.	101	..	..	..	..	..	..	..	..	..	0
4276	- 26. 11⁵⁰	17 miles N.b.E. of Hanstholm	57°24′ N. 8°38′ E.	33	40	½	0	..	..	..	..	..	..	..
—	- - -	—	— —	—	90	—	0	..	..	..	..	..	..	..
4278	- 27. 8⁴⁵	47 miles NW.¾W. of Hanstholm	57°31′ N. 7°18′ E.	200	400	—	0	..	..	..	..	..	..	..
4280	- - 14³⁰	33 miles NW.¼W. of Vorupør	57°15′ N. 7°28′ E.	60	150	—	0	..	..	..	..	..	..	..
4281	- - 17⁵⁵	19 miles NW¼W. of Lodbjerg	57°00′ N. 7°46′ E.	38	100	—	0	..	..	..	..	..	..	..
4282	- 28. 9²⁰	20 miles W.b.N.½N. of Lodbjerg	56°52′ N. 7°39′ E.	40	50	—	0	..	..	..	..	..	..	..
—	- - -	—	— —	—	100	—	0	..	..	..	..	..	..	..
4283	- 28. 11⁰⁵	26 miles W.b.N. of Lodbjerg	56°49′ N. 7°28′ E.	25	50	—	0	..	..	..	..	..	..	..
4284	- - 14⁴⁰	32 miles WNW.¼W. of Lodbjerg	56°55′ N. 7°18′ E.	32	60	—	0	..	..	..	..	..	..	..
4285	- - 17²⁵	43 miles NW.b.W. of Bovbjerg	56°46′ N. 6°55′ E.	35	60	—	0	..	..	..	..	..	..	0
4287	- 29. 14⁴⁵	66 miles W.b.N. of Bovbjerg	56°32′ N. 6°08′ E.	33	70	—	0	..	..	..	..	..	..	..
4288	- - 17¹⁵	68 miles W.½N. of Bovbjerg	56°25′ N. 6°04′ E.	39	70	—	0	..	..	..	..	..	..	..
4289	- 30. 8¹⁵	72 miles NW.¼N. of Horns Reef L. V.	56°19′ N. 5°36′ E.	58	80	—	0	..	..	..	..	..	..	..
4290	- - 11⁵⁵	79 miles NW.½W. of Horns Reef L. V.	56°08′ N. 5°15′ E.	42	80	—	0	..	..	..	..	..	..	..
4292	Oct. 1. 9²⁵	114 miles W.b.N. of Horns Reef L. V.	55°34′ N. 4°00′ E.	37	70	—	0	..	..	..	..	..	..	..
4293	- - 13⁵⁰	115 miles W.b.N.½N. of Horns Reef L. V.	55°48′ N. 4°00′ E.	40	80	—	0	..	..	..	..	..	..	..
4295	- 2. 10⁰⁵	100 miles W.b.N. of Horns Reef L. V.	55°33′ N. 4°22′ E.	39	80	—	0	..	..	..	..	..	..	0
4296	- - 15¹⁵	56 miles W.b.N. of Horns Reef L. V.	55°33′ N. 5°42′ E.	50	100	—	0	..	..	..	..	..	..	..
4297	- - 18⁰⁰	39 miles W.b.N. of Horns Reef L. V.	55°33′ N. 6°09′ E.	42	80	—	0	..	..	..	..	..	..	..
4298	- - 21¹⁵	22 miles W.b.N. of Horns Reef L. V.	55°33′ N. 6°40′ E.	34	65	—	0	..	..	..	..	..	..	..
4299	- 7. 20⁰⁵	15 miles SW. of Nørre Lyngvig	55°51′ N. 7°49′ E.	25	50	—	0	..	..	..	..	..	..	..
4300	- 8. 6¹⁵	42 miles NW.b.W. of Bovbjerg	56°48′ N. 6°58′ E.	38	75	—	0	..	..	..	..	..	..	..
4301	- - 9²⁵	51 miles NW.b.W.¾W. of Bovbjerg	56°45′ N. 6°40′ E.	40	80	—	0	..	..	..	..	..	..	..
4302	- - 11³⁰	57 miles NW.b.W.¾W. of Bovbjerg	56°45′ N. 6°27′ E.	47	90	—	0	..	..	..	..	..	..	..
4303	- - 14⁵⁵	66 miles WNW. of Bovbjerg	56°45′ N. 6°10′ E.	52	100	—	0	..	..	..	..	..	..	..
4304	- - 18⁰⁰	83 miles WNW. of Bovbjerg	56°47′ N. 5°41′ E.	56	120	—	0	..	..	..	..	..	..	..
4305	- 10. 8³⁰	124 miles E.b.S. of Peterhead	57°30′ N. 1°58′ E.	84	160	—	0	..	..	..	..	..	..	..
4306	- - 17⁰⁰	63 miles ESE. of Peterhead	57°18′ N. 0°08′ E.	80	160	—	69	13	19.4	26	69	0	69	..
4307	11. 7⁴⁰	2 miles E. of Girdleness	57°09′ N. 2°00′ W.	40	80	—	116	7	12.9	20	116	13	103	..
4308	- - 8⁵⁰	2 miles NE.¾N. of Girdleness	57°10′ N. 2°01′ W.	23	45	—	62	10	12.2	16	62	0	62	0
4309	- 15. 15³⁵	3 miles NE. of May Island	56°14′ N. 2°31′ W.	46	100	—	42	11	13.0	17	42	0	42	..
4310	- 16. 13¹⁰	7 miles N.b.W. of Longstone	55°45′ N. 1°42′ W.	86	160	—	253	6	11.6	16	253	19	234	0
4311	- - 20²⁰	33 miles E. of Coquet Island	55°29′ N. 0°36′ W.	63	150	—	115	10	16.6	22	115	0	115	3
4312	- 17. 8¹⁰	69 miles E.b.N.¾N. of Whitby	55°06′ N. 1°03′ E.	50	120	—	0	..	..	..	..	..	..	..
4313	- - 15³⁵	76 miles E.b.N.¾N. of Flamborough H.	54°47′ N. 1°44′ E.	30	60	—	0	..	..	..	..	..	..	..
4315	- 18. 12⁰⁵	88 miles E.b.N. of Flamborough Head.	54°33′ N. 2°21′ E.	19	30	—	1	..	9	..	1	1	..	..
4316	- 15⁵⁰	94 miles E.¼S. of Flamborough Head.	54°18′ N. 2°33′ E.	36	60	—	78	6	8.2	13	78	75	3	0
4317	- - 20¹⁵	102 miles E.¾S. of Flamborough Head	54°10′ N. 2°46′ E.	49	120	—	745	6	9.1	16	745	515	230	21
4318	- 19. 8²⁵	143 miles W.b.N. of Horns Reef L. V.	55°47′ N. 3°15′ E.	42	90	—	0	..	..	..	..	..	..	..
4319	- - 14⁰⁰	128 miles W.¾N. of Horns Reef. L. V.	55°23′ N. 3°40′ E.	32	70	—	227	6	8.4	10	227	220	7	0
4321	- 20. 13⁴⁰	120 miles W.¼S. of Horns Reef L. V.	55°06′ N. 4°02′ E.	46	90	—	0	..	..	..	..	..	..	..
4322	- 18³⁵	92 miles W. of Horns Reef L. V.	55°20′ N. 4°05′ E.	48	90	—	0	..	..	..	..	..	..	..
4323	- 21. 8²⁵	102 miles NW.½W. of Horns Reef L. V.	56°22′ N. 4°43′ E.	65	150	—	0	..	..	..	..	..	..	..
4324	- - 11¹⁵	92 miles NW.b.W. of Horns Reef L. V.	56°10′ N. 4°47′ E.	54	130	—	0	..	..	..	..	..	..	..
4325	- - 17¹⁵	78 miles NW.b.W.½W. o. Horns Reef L. V.	55°56′ N. 5°08′ E.	40	100	—	0	..	..	..	..	..	..	..
4326	- - 20²⁰	72 miles WNW.½W. of Horns Reef L. V.	55°44′ N. 5°15′ E.	43	100	—	0	..	..	..	..	..	..	..
4327	- 22. 9⁴⁵	19 miles NNW. of Horns Reef L. V.	55°50′ N. 7°00′ E.	32	75	—	0	..	..	..	..	..	..	..
4342	- 27. 16¹⁵	10 miles SE.b.S. of Horns Reef L. V.	55°27′ N. 7°37′ E.	26	60	—	0	..	..	..	..	..	..	0
4343	- - 20⁵⁰	11 miles N.b.W. of Horns Reef L. V.	55°44′ N. 7°13′ E.	30	40-60-80	—	0	..	..	..	..	..	..	0
4344	- 28. 1³⁵	38 miles N.b.W. of Horns Reef L. V.	56°10′ N. 6°55′ E.	39	40-70-100	—	0	..	..	..	..	..	..	0
4345	- - 6⁵⁰	48 miles W.b.N. of Bovbjerg	56°32′ N. 6°39′ E.	45	40-70-100	—	0	..	..	..	..	..	..	0
4346	- - 10²⁰	60 miles NW.b.W.¾W. of Bovbjerg	56°52′ N. 6°24′ E.	52	30-70-120	—	0	..	..	..	..	..	..	0
4347	- - 13¹⁵	44 miles W.b.N.¼N. of Lodbjerg	56°52′ N. 6°54′ E.	40	30-60-100	—	0	..	..	..	..	..	..	0
4348	- - 16⁴⁰	26 miles W.b.N.½N. of Lodbjerg	56°52′ N. 7°29′ E.	28	30-60	⅓	0	..	..	..	..	..	..	0
4349	- - 19³⁰	22 miles NW.b.W. of Lodbjerg	56°59′ N. 7°39′ E.	24	30-60	—	0	..	..	..	..	..	..	0
4350	- - 22²⁵	10 miles N. of Lodbjerg	56°59′ N. 8°13′ E.	27	30-60	—	0	..	..	..	..	..	..	0
4352	29. 7³⁵	27 miles N.b.W. of Hanstholm	57°31′ N. 8°18′ E.	128	30-100-225	½	0	..	..	..	..	..	..	0
4354	- 10³⁵	11 miles N.½W. of Hanstholm	57°17′ N. 8°32′ E.	29	30-60	⅓	0	..	..	..	..	..	..	0
4356	- 14⁴⁵	20 miles W.¾S. of Rubjerg Knude	57°20′ N. 9°11′ E.	22	50	½	0	..	..	..	..	..	..	0
4357	- - 16⁴⁵	10 miles W.½S. of Rubjerg Knude	57°25′ N. 9°28′ E.	15	50	—	0	..	..	..	..	..	..	..
4358	- - 19¹⁰	5 miles NW.¼W. of Hirshals	57°38′ N. 9°50′ E.	29	30-60	⅓	0	..	..	..	..	..	..	0
4359	- - 21⁵⁵	10 miles E.b.N.½N. of Hirshals	57°39′ N. 10°14′ E.	21	30-60	—	0	..	..	..	..	..	..	..
4361	- 30. 1⁵⁰	8 miles SSE. of Skagen L. V.	57°40′ N. 10°51′ E.	29	30-60	—	36	7	13.6	21	54	6	48	0
4362	- - 7³⁰	2½ miles ESE. of Trindelen L. V.	57°28′ N. 11°24′ E.	27	25-50	—	30	6	10.5	17	45	33	12	0
4363	- - 11¹⁰	14 miles S.¾E. of Trindelen L. V.	57°15′ N. 11°27′ E.	59	30-70-150	½	175	6	9.6	19	175	106	69	0
4364	- 13¹⁰	½ mile W. of Kobbergrund	57°09′ N. 11°23′ E.	16	30	¼	153	6	9.3	16	306	242	64	0
4365	- - 15²⁵	7 miles SE.b.E.½E. of Kobbergrund	57°06′ N. 11°35′ E.	23	25-50	⅓	46	6	10.0	15	69	34	35	0
4367	- - 18⁵⁰	12 miles NNE. of Anholt Knob L. V.	56°58′ N. 11°54′ E.	15	25	¼	449	5	9.3	20	898	618	280	18
4368	- - 21⁰⁵	2 miles S. of Anholt Knob L. V.	56°45′ N. 11°51′ E.	47	30-60	⅙	210	5	9.2	19	630	432	198	36
4369	- - 23⁰⁰	12 miles SE.b.S. of Anholt Knob L. V.	56°36′ N. 12°06′ E.	25	30-60	—	75	8	11.3	18	225	81	144	12
4370	- 31. 8¹⁵	5 miles N.b.E.¾E. of Nakkehoved	56°12′ N. 12°23′ E.	24	25-50	⅓	12	8	10.2	15	18	10	8	0

Table II. Length in mm of Larvae of Herring caught in Ring Trawl in the North Sea and the Kattegat in the Autumn of 1930.

No. of Station	4306	4307	4308	4309	4310	4311	4315	4316	4317	4319	4361	4362	4363	4364	4365	4367	4368	4369	4370
Position	57°18′ N. 0°08′ E.	57°09′ N. 2°00′ W.	57°10′ N. 2°01′ W.	56°14′ N. 2°31′ W.	55°45′ N. 1°42′ W.	55°29′ N. 0°36′ W.	54°33′ N. 2°21′ E.	54°18′ N. 2°33′ E.	54°10′ N. 2°46′ E.	55°23′ N. 3°40′ E.	57°40′ N. 10′51° E.	57°28′ N. 11°24′ E.	57°15′ N. 11°27′ E.	57°08′ N. 11°25′,5 E.	57°06′ N. 11°35′ E.	56°58′ N. 11°54′ E.	56°45′ N. 11°51′ E.	56°36′ N. 12°06′ E.	56°12′ N. 12°23′ E.
Date	10/10	11/10	11/10	15/10	16/10	16/10	18/10	18/10	18/10	19/10	30/10	30/10	30/10	30/10	30/10	30/10	30/10	30/10	31/10
Depth in m.	80	40	23	46	86	63	19	36	49	32	29	27	59	16	23	15	47	25	24
Wire-Length in m.	160	80	45	100	160	150	30	60	120	70	30-60	25-50	30-70-150	30	25-50	25	30-60	30-60	25-50
mm.																			
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	2	..	..
6	..	..	..	..	2	..	..	1	1	2	..	1	2	8	2	15	20	..	..
7	..	5	..	..	6	..	..	15	19	16	1	5	24	38	2	34	43	..	..
8	..	4	..	..	5	..	..	34	117	101	1	8	40	47	10	52	59	5	5
9	..	4	..	..	6	..	1	25	123	101	2	8	40	28	9	50	20	22	2
10	..	7	5	..	30	2	..	2	75	7	7	2	20	7	9	20	12	16	1
11	..	9	9	8	65	2	..	..	20	..	2	..	16	5	2	6	10	5	..
12	..	19	15	10	80	4	..	..	8	..	2	1	10	5	2	9	15	5	1
13	1	26	17	9	32	8	..	1	7	..	2	..	12	8	4	11	12	4	1
14	3	11	12	9	21	11	..	..	1	..	3	2	8	3	3	9	8	5	1
15	5	11	3	3	3	11	..	..	4	..	4	1	2	3	3	8	3	5	1
16	9	10	1	1	3	14	..	..	1	..	3	1	..	1	..	2	2	2	..
17	7	5	..	2	..	19	..	..	..	..	4	1	..	..	..	1	2	3	..
18	3	4	..	..	..	16	..	..	..	..	3	..	..	..	..	1	1	3	..
19	4	..	..	..	..	10	..	..	..	..	..	..	1	..	..	2	1	..	..
20	7	1	..	..	..	10	..	..	..	..	..	..	..	..	..	1	..	..	..
21	8	..	..	..	..	6	..	..	..	..	2	..	..	..	..	..	..	..	..
22	10	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
23	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
26	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total No.	69	116	62	42	253	115	1	78	376[1]	227	36	30	175	153	46	226[1]	210	75	12
Mean Length mm.	19.4	12.9	12.2	12.6	11.6	16.6	9.0	8.2	9.1	8.4	13.6	10.5	9.6	9.3	10.0	9.3	9.2	11.3	10.2

[1] only part of specimens captured were measured.

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